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GRO Summer Internship Final Report
Biofilters and Biomimicry: A Means of Addressing Green Roof Runoff
Annette Sparks
North Carolina A&T State University, Greensboro, NC

My GRO Fellowship summer internship was in Region 8 Headquarters, Denver, CO in the Infrastructure Office of Technical Management Systems (TMS). Having expressed my interest in working on the Region 8 green roof during the interview process with Craig Greenwell, who was my Project Advisor, I was prompted to create a long term method of remediation for the green roof upon my arrival. The roof was experiencing growth challenges in the absence of proper fertilization and irrigation. This scheme was to be in the format of a design proposal to prepare me for my senior design courses and final project in the biological engineering program at North Carolina A&T.

I set out to investigate green roofs, biofilters, and biomimicry through scientific journals and technical articles, training courses, and networking with scientist and engineers in the Region 8 offices and lab. In my internship, I sought to:

- Make my initial green roof proposal more realistic (see initial abstract and internship abstract below).
- Create a design proposal that introduced a method of long-term remediation for the Region 8 green roof specifically or green roofs in general.

Initial Abstract

By conducting a comparative analysis on green architecture in the United States and South Korea, and combining the best of both styles, I aimed to design a unique green roof that maximizes the benefits of green roof applications with special regard to air quality improvement and roof runoff filtration, while maintaining existential aesthetic appeal. This research will take two years to complete. Overall this project will mitigate greenhouse gases and encourage efficient water use.

Revised Abstract

Green roofs have been known to leach nutrients, especially during establishment (the first 18-24 months). Activated carbon is known for its filtering capabilities, while peanut shells, a large agricultural waste product, are known to have filtering potential. By conducting a comparative analysis on green roof substrates in two different regions of the United States with one, both, or neither of these biofiltration components introduced, I aim to design a unique green roof following the principles of biomimicry that will yield a substrate that enhances the quality of runoff from green roofs. This project will span two to three years.

The results of all or a portion of my new research proposal are to be determined in the near future via my senior design courses and senior project at North Carolina A&T. According to my mentors here at Region 8, I have a very promising and original design worth testing.

During my internship I applied skills I already knew and participated in a variety of tasks relevant to my major and to green infrastructure. For instance, I:

- Conducted myself with professionalism
- Sat in on several weekly and monthly meetings (infrastructure, technical management systems, all hands)
- Attended Green Roof Training Classes (4 days in Philadelphia)

- Attended talks on regional projects and updates
- Networked with individuals in a variety of fields to gain more understanding on things related to my project and other areas of interest
- Scheduled working meetings
- Helped collect water samples from urban streams for water quality testing.
- Created a PowerPoint presentation and flip book template and demos for security awareness.
- Used MS Excel for cost and energy analysis of lamps and printers).

Most importantly, I was able to work on my research just about every day (finding articles, breaking down technical information, writing, and citations), and reported updates on the progress of my project to my mentor via email and occasional office visit on a weekly/bi-weekly basis.

My internship also helped me to acquire some useful new skills. I learned how to conduct a cost and energy analysis and how to assemble the analysis properly in spreadsheets for a variety of purposes. This will help me in my daily life and in the future if I am so fortunate to be employed by the EPA after graduation. I also learned how to conduct an extensive literature review using highly scientific and technical sources. This will help me in my immediate academic career and my future professional career as well.

My internship did more than keep me busy and exercise my skills. Interning with Region 8 taught me a lot about myself and helped me grow as an individual. I learned that even though I am able to work independently I work even better in teams. I also discovered I like to be stimulated through variety. Towards the end of the summer I lost interest in my research. Not because it wasn't interesting (it was) but because it became too repetitive and routine. So I now imagine a perfect job for me in the future would be a combination of office/lab work and field work.

Furthermore, I learned a lot about life, what I want from it and what I don't. I discovered I don't want to be an engineer anymore. I love to design and create. I like coming up with new ideas. I tremendously enjoy working with my hands and making things work. Engineers do that to a certain extent but not to the same degree as architects, which is why I now wish to pursue a Master's in landscape architecture someday. With training in biological engineering and landscape architecture, my chances of inventing a green roof growing medium that actually *enhances* water quality will be much better.

I say someday, because I realized this summer that school may no longer be the life path for me. Over the course of 12 weeks I learned I don't really care to get published in a scientific journal or to become a specialist on one topic. I have no desire to be a pure intellectual because I like working with down-to-earth people and would like to continue to do so in the future. From my observations, pure intellectuals sometimes lose touch with the world and are a challenge to work with. So if school is no longer the route for me immediately following my undergraduate degree I would like to join the US Army and work as a water treatment specialist for a while so that I may not only serve my country (a very rewarding, honorable, and irreplaceable experience, I have learned from speaking with veterans in Region 8) but also gain hands-on experience in my field and really put my degree to everyday practical use, perhaps even become a technical expert. Overall I just want to make a difference, to make positive effective change, and really find my place in this world.

All things considered, my internship experience with Region 8 exceeded my expectations by leaps and bounds. The work environment is relaxed yet driven, comfortable yet professional. I liked it so much I applied for a co-op position in the fall. If given the opportunity to work with the EPA after graduation I would strongly consider returning. This was by far one of the best internship experiences of my undergraduate matriculation. Everyone I had the pleasure of meeting in Region 8 was very knowledgeable and approachable. People were always willing to answer questions and provide information. If it happened they did not readily know the information, they would gladly put me in touch with someone who did. Region 8 is dedicated to protecting human health and guarding the natural environment, especially under the Region's new leadership, Jim Martin, who has elevated the focus on the well-being of Tribal Nations. In infrastructure where I worked, the mission was carried out daily by providing and maintaining a sustainable work environment and looking for ways to make it even better. Overall, people in Region 8 actively work in teams on a daily basis to uplift the mission and one another. I enjoyed working in Region 8 and will miss going to work there every day.

For future EPA GRO Fellows anticipating their summer internships, I would tell them: "Your internship with EPA will be what you make it, so be energetic, be interested, and be personable." My second day on the job was the new Region 8 Administrator's first day. After he addressed everyone at the all hands meeting, he asked if anyone had any questions. When no one raised a hand I saw that as my opportunity to put myself out there. I introduced myself to everyone, asked an intelligent question, and for the rest of the summer people kind of remembered and it felt a lot easier for me to meet people in my office and on other floors. I think it felt easier because I didn't feel so new. So, fearlessly take the initiative and get to know as many people as possible: not just their job title but why they are in the field they are in and even where they are from and where they went to school. Everyone has a story and each one is interesting and holds valuable wisdom. Hearing other people's experiences surely helped me to ground myself and mold my ambitions and I am equally certain it will help you too. Lastly, I would like to say keep in touch with the people you meet during your internship. Maybe once a semester send a friendly update email on your progress. Not only is it courteous, but who knows what other opportunities may come your way by just keeping in touch. Make your internship with EPA your best internship ever.